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Capt. W. H. Smyth, R.N., Vice-President, in the Chair.

Transit of Mercury, Nov. 8–9, 1848.

By the Rev. W. R. Dawes, at Cranbrook.

"My attention was directed principally to the appearance of the planet at its ingress, and to measurements of its diameter during the transit.

"The ingress was observed with my 8½-foot achromatic, the aperture being limited to 4 inches, the eye-piece magnifying 87 times. So extremely undulating was the edge of the sun in general, that no advantage seemed to arise from an increase of power. Nothing remarkable was noticed till *Mercury* had advanced on the sun's disc to about three-quarters of its own diameter, when the cusps appeared much rounded off, giving a pear-shaped appearance to the planet. The *degree* of this deformity, however, *varied* with the steadiness and definition of the sun's edge, being *least* when the definition was *best*. A few seconds before the complete entrance of the planet, the sun's edge became much more steady, and the cusps sharper, though still occasionally a little broken towards their points by the undulations. At the instant of their junction the definition was pretty good, and they formed the finest conceivable line, *Mercury* appearing at the same time *perfectly round.*

"The impression upon my mind was, that the distortion of the planet arose entirely from the rounding off of the points of the cusps by the tremor and diffusion of the image. I have repeatedly observed precisely the same appearance at the ingress and egress of the shadow of a satellite of *Jupiter*, when the edge of the planet has been rather undulating and diffused.

"For the measurement of the diameter of *Mercury*, I had prepared several different instruments. The filar micrometer was applied to the 8½-foot equatorially mounted achromatic, the clock motion being in use. A 5-foot achromatic by Dollond was furnished with one of his spherical crystal double-image micrometers, and mounted on a very stout floor-stand with an equatorial socket. An excellent Gregorian reflector, of 5 inches aperture and 20 inches focus (the large metal figured by Cuthbert), and furnished with its own divided object-glass heliometer, was also employed. And, lastly, a spherico-prismatic crystal double-image micrometer was

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applied to the 8½-foot equatoreal. Measurements were obtained with each of these instruments, but, from the excessive tremor which usually affected the image, the results were not very satisfactory.

With the 8½-foot equatoreal and filar micrometer, power 163, aperture reduced to 2·84 inches,

Polar diameter of *Mercury* = $9''\cdot3694$, six observations.

Same instrument and power, aperture 4·02 inches,

Polar diameter = $9''\cdot3890$, six observations.

The mean of the two sets = $9''\cdot393$.

Same telescope, and spherico-prismatic micrometer, power 184,

Polar diameter = $8''\cdot89$, three observations.

With the 5-foot achromatic and the spherical micrometer, power 117,

$$\left.\begin{array}{ll}\text{Polar diameter, by four observations} & = 9''\cdot02 \\ \text{Equatoreal diameter, by two do.} & = 9\cdot36\end{array}\right\}\text{diff.} = 0''\cdot34$$

With the heliometer on the 20-inch Gregorian, power 115,

$$\left.\begin{array}{ll}\text{Polar diameter, by four observations} & = 8''\cdot89 \\ \text{Equatoreal diameter, by ten do.} & = 9\cdot20\end{array}\right\}\text{diff.} = 0''\cdot31$$

"No difference is recognised in the *Nautical Almanac* between the polar and equatoreal diameters of this planet; yet my observations, both with the 5-foot achromatic and the Gregorian, shew a perceptible difference, and nearly to the same amount. And it was noticed with each of the double-image micrometers that a satisfactory measure of the equatoreal diameter was always perceptibly too large for the polar diameter, the images appearing slightly separated; and that, on the contrary, with a good measure of the polar diameter, the images overlapped when placed in the direction of the equator. The change was repeatedly made from one to the other, and always with the same result. The compression would thus appear to be about $\frac{1}{29}$.

"It will be remarked that no sensible difference was produced in the apparent diameter by varying the aperture from 4·02 inches to 2·84 inches. The same darkening glass was employed with both apertures; and therefore, though the *telescopic* irradiation would be *least* with the *larger* aperture, yet, the image being brighter with that aperture, the *ocular* irradiation would be *greater*. Probably, therefore, the two effects might counteract each other.

"The measurements, though few, were taken with extreme care, each of them having been repeatedly examined under the best views before it was read off."

By Mr. T. Dell, at Dr. Lee's Observatory, Hartwell.

"The time was taken from the transit-clock, the error of which was well known from observations on the 7th and 8th. The first contact was not noted with any degree of certainty: the interior contact was well observed.

Interior contact $14^{h}\,18^{m}\,55^{s}\cdot3$ Sid. Time, or $23^{h}\,3^{m}\,57^{s}$ M. Time at Hartwell.

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"My attention was directed by the Rev. Mr. Reade to a phenomenon described by the late Professor Moll (*Mem. Ast. Soc.* vol. vi. p. 116), a recurrence of which we all observed,—Mr. Reade and his assistant, with a Gregorian telescope, at Stone, and again with me here. This is a considerable greyish spot on the disc of *Mercury*, very indefinite, but gradually shading off from the brightest point in the centre to the blackness of the rest of the planet. I have attempted to give some idea of this appearance in the drawing annexed, as seen with a power of 240; with a less power we could not distinguish it."

By the Rev. Mr. Reade, at his Observatory, Stone.

Mr. Reade has sent a drawing of the grey spot observed in *Mercury*, which agrees with Mr. Dell's. The observations consist of a numerous series of angles measured from *Mercury* to spots on the sun, from which M. Fazell has made an elaborate chart of the path of *Mercury* over the sun's disc.

By Mr. Hartnup, at the Observatory, Liverpool.

Equatoreal, 8½-inch achromatic; power, 134.

Internal contact $23^{h}\ 6^{m}\ 54^{s}{\cdot}4$ Greenwich Mean Time.

"The instant is noted at which the sun's light was first seen to surround the planet completely."

NEPTUNE.

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

				Obs^{d}—Cal^{d}	
	Greenwich M.T.	R.A.	N.P.D.	R.A.	N.P.D.
1848.	h m s	h m s	° ′ ″	s	″
Oct. 25	10 11 42·9	22 8 52·66	102 8 28·8	−1·62	+ 7·4
27	9 36 22·7	8 48·74	8 48·6	1·72	7·5
29	8 30 54·9	8 45·76	9 6·5	1·37	8·4
Nov. 4	6 22 12·0	8 38·63	9 40·7	1·43	7·8
6	7 58 45·8	8 37·12	9 46·3	1·52	7·2
7	8 50 53·7	8 36·95	9 50·5	1·20	9·4
9	9 39 43·8	8 35·93	9 50·7	1·62	8·0
10	5 43 48·6	5 36·02	9 50·9	1·44	8·3
21	7 58 42·4	8 43·36	9 1·8	1·63	9·5
24	7 5 54·5	22 8 48·24	102 8 34·9	−1·51	+11·3

The observations have been corrected for refraction and parallax, and compared with Mr. Adams' Ephemeris.

The star of comparison, for all the observations, is B.A.C. 7722.

The mean place for Jan. 1, 1848, according to the Catalogue, is

$$\text{R.A.} = 22^{h}\ 2^{m}\ 29^{s}{\cdot}78 \qquad \text{N.P.D.} = 102^{\circ}\ 18'\ 34''{\cdot}56$$